

the second comet of 1826 would be "drowned in Eridanus," as the sky had been overcast ever since it entered this constellation; on which Mr. Cooper ("Cometic Orbits," p. 152) is tempted to remark that, had Pons "written from the interior of Ireland, there would have been little to fear, for he might have made quite sure of it!"

THE SATELLITES OF MARS.—Both satellites of Mars have been observed with the Washington refractor; the measures of *Deimos* commenced on October 13, clouds interfering on the 10th, when it was first seen, and those of *Phobos* on the 12th. The correction required to the periodic time of *Deimos*, as determined by Prof. Asaph Hall from the observations of 1877, is so small that it will only be certainly ascertained from an exact discussion of the measures at this opposition; the periodic time of *Phobos* requires to be diminished 1'074s., or the corrected period is 7h. 39m. 13'996s.

Phobos and *Deimos* are also under observation with the Ealing reflector.

PHYSICAL NOTES

THE Scientific American describes a self-resonant tuning-fork, the invention of the indefatigable Edison. It consists of a tube of thick bell-metal closed at one end, and sawed down longitudinally nearly to the closed end, thus making two "prongs" united to a common base. To tune the prongs into unison with the column of air between them, the tube is put into a lathe and turned thinner and thinner until unison is reached. But how such forks are made of any precise pitch, or how the inclosed air-column contrives to vibrate in spite of the long lateral cuts, our contemporary does not vouchsafe to inform us. There are not many organ-pipes that would resound to their proper note with a saw-cut incised down them front and back.

FOR observation of atmospheric electricity M. Mascart (*Journ. de Phys.*, October) uses a Thomson electrometer connected with a vessel having continuous outflow of water. The deflections of the needle are transmitted every two and a half minutes to a pencil which records them on a sheet of paper. The series of traces forms a curve, not continuous, indeed, but nearly so. This apparatus was put in action at the College of France in the end of February this year, and the curves obtained during the following five months present several interesting features. The potential of the air is shown to be generally positive, with more or less rapid variations. In bad weather the curves become more irregular; rain nearly always produces very great negative deflections. The change of sign appears before the rain comes, and sometimes rain is followed by very high positive indications. There are also some very rare cases of positive rains, and of great negative deflections without apparent rain in the neighbourhood. (This predominance of negative electricity in rain clouds M. Mascart regards as an important point in the question of the origin of atmospheric electricity.) Neglecting accidental variations, one is struck by the fact that the electricity is much more uniform at night and more variable by day. The potential is also considerably higher at night than in the day. The maximum seems to occur about 9 or 10 P.M.; the curve descends slowly towards 6 A.M., then more rapidly; reaches a minimum about 3 P.M., and then rises again in a nearly uniform manner. The indications by the curves are confirmed by numerical tables of monthly averages of eight daily observations at three hours' interval. The results thus obtained are in contradiction with ideas commonly adopted. M. Mascart remarks that the continuous maximum of positive electricity observed at night may be of an exceptional character, owing to the anomalous season; He also suggests the possibility of previous observations having been vitiated through defective insulation.

THE influence of changes of temperature and pressure on double refraction has been recently investigated by Herr Pfaff, of the Erlangen Society of Physics and Medicine, and with (briefly) the following results:—In crystals of the rhombohedral system, when the temperature is raised, double refraction diminishes in quartz, but increases in vesuvianite, beryl, and apatite; it is not changed in Iceland spar (perpendicular to the principal axis), carbonates of iron and of magnesia, tourmaline, mellite, ferro-cyanide of potassium, zircon, and cassarite. In the orthorhombic system it increases in the case of arragonite (perpendicular to the median line), celestine (parallel to P); it diminishes in topaz, celestine, and heavy spar (perpendicular to the median line). In the clinorhombic system it diminishes in adularia (parallel to the median line) and mica; it increases in gypsum (parallel to

the primary cleavage), remains constant in anhydrite, topaz, arragonite (inclined to the median line), witherite, carbonate of lead, adularia parallel to M), and the anorthic crystals, albite, oligoclase, labrador, anorthite, axinite, cyanite, and sulphate of copper. Pressure on the whole surface produces the same effect as a lowering of temperature in carbonate of magnesia, Iceland spar, celestine, gypsum, and heavy spar; the others do not present any modification, even those which, like topaz and vesuvianite, are very sensitive to variations of temperature.

PROF. REITLINGER and Dr. Urbanitzky have recently presented to the Vienna Academy the first portion of a memoir "On the Phenomena of Geissler Tubes under External Action," giving in more developed form, an investigation, of which they had already published some results. Various interesting experiments are described, e.g., with reference to the attractions and repulsions of the light columns in Geissler tubes, and a possible joint action of the electrostatic and dynamic states in these, the authors hung a strip of tinfoil (15 cm. long) from a platinum electrode at the top of a tube, 20 cm. long, connected with a mercury pump (the second electrode being a straight platinum wire). Before rarefaction commenced the strip flew to the side, immediately the Ruhmkorff was set in action. But on rarefying, this phenomenon became less pronounced, till at 7 mm. the strip hung freely down in the middle. When in this state, it was attracted by a shellac rod rubbed with cloth, and repelled by a glass rod rubbed with amalgam (if the strip was connected with the positive pole, conversely in the other case); but these actions diminished as the rarefaction proceeded, becoming hardly perceptible at 4 mm. with the strip positive, and even at 6 mm. in the other case. A good conductor brought near caused attraction at all degrees of rarefaction in one case; but this, too, disappeared in the other. An experiment showing how the action of static electricity on a conductor is arrested when the latter is made a carrier of dynamic electricity, was made by bringing a rubbed glass or vulcanite rod near the strip, which thereupon went from the vertical to an inclined position. On sending through it the induction current (in either direction) the strip recurred at once to the vertical and remained there.

M. NIAUDET has lately constructed for Prof. Stefan, of Vienna, a Gramme magneto-electric machine, in which the permanent steel magnets are of circular form, instead of the usual elongated horse-shoe shape. The soft iron cheeks which embrace the rotating armature are also of a peculiar form. The new machine is much more compact than those hitherto constructed, and gives very satisfactory results.

A VERY singular theory of electricity and magnetism has recently been put forward by M. Bjerknes, who endeavours to explain the various phenomena upon mechanical principles. If a number of spherical bodies are plunged in an incompressible liquid, in the midst of which they execute isochronous vibrations, they are found to exercise certain forces upon one another. These forces may be either attractive or repulsive, according to the nature of the motions executed. Thus the actions exercised by an electrified particle may be illustrated by a pulsating sphere, that is to say, one which periodically increases in volume. A sphere vibrating to and fro similarly represents a magnetic particle. Unfortunately, however, the theory, to be applicable to electric and magnetic phenomena, would require the forces to act just in opposite directions to that which is found to be the case; for with M. Bjerknes' spheres the like poles attract, while the dissimilar poles repel. Experimentally, the attractions and repulsions thus theoretically deduced have been observed by means of an ingenious apparatus constructed for the inventor in Sweden. The pulsating bodies are a species of elastic capsule suspended from knife-edges by a hollow tube, by means of which the air is forced into and out of the capsule in rapid alternations. The vibrating bodies are little spheres set in motion by delicate levers. The mechanism is in each case driven by a pulley turned by hand. The liquid in which they are immersed is water, and the resultant attractions and repulsions are very clearly demonstrated.

M. GERNEZ has been studying the little-known phenomena of evaporation and distillation under the influence of electrification, discovered by the Abbé Nollet in 1746. The results of M. Gernez's observations have been communicated by him to the Physical Society of Paris, and are of considerable interest. Two concentric tubes communicating with one another above only are filled with a liquid to a common level. Sparks from a Holtz

machine are then passed across the intervening air, when it is found that the level rises at the negative and falls at the positive pole. There is, therefore, apparently an actual transport in the direction conventionally agreed upon as the direction of the current. M. Gernez is inclined to attribute this phenomenon to an electrical transport of the liquids along the moistened surfaces of the tubes. Pure alcohol distils over thus at a rate three times as great as that of water, but a mixture of alcohol and water in equal parts at a less rate than pure water. The rapidity of the distillation is increased by the addition of any soluble salt or of a few drops of sulphuric acid or of ammonia solution. No appreciable amount of distillation takes place with bisulphide of carbon, tetrachloride of carbon, or with turpentine. M. Gernez, however, does not think that there is any assignable relation between the conductivity of a liquid and its rate of electro-convective evaporation; nor does he think that there is any necessary connection between this phenomenon and that discovered by Porret of the electric endosmose of liquids across diaphragms of various kinds.

GEOGRAPHICAL NOTES

AT the last meeting of the Russian Geographical Society, in the section of Physical Geography, M. Rylcke communicated the results of his precise measurements on the levels of the Baltic and of the Black Sea. These measurements were begun in 1877, by order of the General Staff, according to the resolutions of the Brussels Congress. Accurate measurements in the ports of the Baltic have proved undoubtedly that the level of the sea at Cronstadt is, by nearly two feet, higher than at Reval, and that its height decreases regularly from north to south, this conclusion being fully supported by Prussian measurements at Memel and at Kiel. For a comparison of the level of the Baltic with that of the Black Sea the necessary computations are not yet advanced enough to yield trustworthy results.

IN his last paper on the Agomes Islands (*Izvestia*, 1879, p. 37) M. Michuho-Maclay says that here he happened to determine the dimensions of the heads only of fourteen men, and that the so-called "index of the breadth" varied from 69.6 to 81.3; it was thus nearly the same as on the Taui Islands (70.5 to 84.5), where the traveller has done no less than 119 measurements, and does not much differ from what was seen of the Papuans of New Guinea, whose "index" varies from 62.0 to 86.4. According to this wide variation of the "indexes," M. Maclay affirms that we have no right to describe the heads of Melaneseans as well as those of the Papuans as dolichocephalic, but rather as mezoecephalic; and that the form of the head must not be considered as a proof of a race-distinction between Negritoes and Papuans, as both Melaneseans and Papuans display an obvious tendency to brachycephalism, whilst this last was formerly considered as a distinctive feature of the Papuans from the natives of the Philippine Islands. He considers also that within the same races we shall always find both forms of heads, and that a true classification of human races cannot be established on this sole feature; it must be based on a thorough study of the whole of the comparative anatomy. A few measurements on living subjects, however accurate, cannot give the necessary solid bases for a scientific classification.

ACCORDING to a telegram received in Paris from Sierra Leone, two Frenchmen, MM. Zweifel and Moustier, have at length discovered the sources of the River Niger, a feat which has hitherto baffled all explorers. The party appear to have been recently instructed by their employer, M. Verminck, of Marseilles, to explore the Niger for both scientific and commercial purposes; and accordingly, starting from Sierra Leone and following the course of the Rohelle, they reached the foot of the Kong Mountains. By adroit treatment of the hostile tribes at this point, where foreigners had always been refused passage, they were allowed to pass the mountains and explore the three streams which, uniting after a short distance, form the River Niger.

BEFORE concluding his recent explorations in South America, Dr. Crevaux made two attempts to ascend the Ica or Putumayo tributary of the Amazon. Having failed the first time, he ascended the main stream to Tabatinga, on the frontier of Peru and Brazil, and then returned to Para. He there obtained means to enable him to carry out his original intention, and at the second attempt succeeded in ascending the Ica to Cnemebe, to the north of Cotopaxi, on the frontier of Bolivia and Ecuador. Starting from this place on May 16, Dr. Crevaux reached the

foot of the Andes in eight days. Thence continuing his route towards the north, he arrived at the sources of the Japura after sixteen hours' march. After experiencing great hardships, and hostility on the part of the natives, he reached the Amazon again on July 9, arriving at Para on July 24. He has brought back with him much information interesting alike from a geographical and ethnographical point of view, as well as a collection of plants, which are expected to prove useful as medicines.

IN publishing an interesting letter from its special correspondent with the Russian expedition against the Tekke Turkomans, the *Daily News* states that the "nature of the ground along the course of the Attek from the Caspian Sea has never been accurately described from personal observation." Without wishing to undervalue this and other letters from the same source, we may be permitted to point out that the ground had been previously examined by a party under General Llomakin, and that Sir Henry Rawlinson, in his paper on the "Road to Merv," read before the Geographical Society on January 27, quoted at length from Russian newspapers a description of this very route by a member of the expedition. A summary of the letters, giving an account of this expedition, which had been addressed to the *Moscow Gazette*, also appeared in *NATURE*, vol. xix. p. 271.

A LETTER from Herr Hildebrandt, dated Nossibé (Madagascar), states that he has visited Beravi, where the unfortunate traveller, Dr. Chr. Rutenburg, was murdered some time ago. Hildebrandt erected a stone monument on the spot; the body, however, could not be found, in spite of the most assiduous inquiries, the murderers having thrown it into a mountain torrent. Hildebrandt has photographed the spot, and sends a copy to Bremen, accompanied by the last diary and stenographical notes of Rutenburg.

THE Geographical Society of Algiers has nominated for its president M. MacCarthy, an explorer of the Algerian Sahara, who is settled in Algiers, and has been appointed librarian of the National Library of Algiers. This Society has been divided into three sections: Political Geography, Economical Geography, and Physical Geography.

THE Belgian African Society has received letters from Zanzibar, according to which MM. Popelin and Van der Heuvel had arrived at Mpwapwa on August 15 and at Chunya on September 2. They were to leave the latter place on September 3, and to penetrate into the Ugogo district. At Mpwapwa they met the elephant caravan led by Carter. Each elephant carried about 10 cwt. The march was performed most satisfactorily. In the districts where the tsetse flies abound, the animals were often covered by them without feeling any the worse for it. Only one elephant died through change of nourishment, the whole caravan being fed with what the country offered. M. Dutalis, who suffered from a severe attack of fever, has returned to Europe.

THE Geographical Society of Munich has conferred the title of Honorary Members upon Prof. Nordenskjöld, Dr. Joseph Chavanne (Vienna), and Dr. Emil Holub (Prague). The reception of the latter upon his return to Prague was most enthusiastic. He had been absent for over seven years. The Vienna Geographical Society has elected the following gentlemen as Honorary Members:—Prof. Ujfalvy (Paris), General Kauffmann (Tashkend), Dr. E. Holub (Prague), and Prof. Arendts (Munich). The last-named gentleman has also been nominated Corresponding Member of the Paris Society for commercial geography.

A GENERAL "Geographentag" will be called at Berlin during the summer of 1880. Its special object will be the consideration of plans for the formation of a great German "Gesellschaft für Erdkunde." The idea is not a new one, but projects for the new General Society have already been mooted upon several occasions. At the recent Karl Ritter celebration at Berlin, a "commission" was appointed and charged with the working out of certain preliminaries referring to the subject. The commission is formed of Dr. Nachtigal (Berlin), Prof. Neumayer (Hamburg), Prof. Bruhns (Leipzig), Prof. Rein (Marburg), and Dr. Roth (Dresden).

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—In a congregation held on Tuesday, November 18, the amendments to the proposed statute to confer degrees in natural science were taken into consideration. The proposed statute made Greek an optional subject in the natural science